the reader is gratified by a brief description of the theory on which the device is founded, but in many cases no hint is given.

In our opinion the value of the book would be very greatly increased by additional brief descriptions of the physical laws which govern the action of many of the devices used by engineers. For example, a table of the rating factors by which the voltage of a given circuit breaker must be multiplied so as to get its rating at various heights above the sea level is given. It would be useful to give the theory used by the General Electric Company of America in getting these numbers.

Many types of the spark gaps used in practice are given, and it is pointed out that the sphere gap has a greater speed of discharge than the horn gap. The "impulse gap," which we believe was perfected during the war in connexion with the spark gap used in the magneto circuit of an aeroplane, is now adopted for lightning arresters. The Westinghouse Company state that it is more efficient than any other spark gap. An investigation of the action of the lightning arresters described would be a very promising field of research for the pure physicist.

In reading this book one gets accustomed to the American words "resistor" and "reactor" which are used for "resistance" and "reactance coil" respectively, and these words might well be adopted in this country. Electrical engineers talked about "omnibus bars" thirty years ago, it then became "bus bars," and now apparently it has become "busses." This book will be useful to the switchgear expert.

A. R.

A Modern Text-book of Chemistry.

Inorganic Chemistry. By Prof. T. M. Lowry. Pp. xi + 943. (London: Macmillan and Co., Ltd., 1922.) 28*s.* net.

FIFTY years ago there were no books on physical chemistry. The work which had been done on the borderline of physics and chemistry was scattered in different journals and was not readily accessible to the student. The first volume of Miller's "Chemistry," Tilden's "Chemical Philosophy," and certain articles of the old Watts's "Dictionary" were the first available summaries of what is now one of the most important branches of the subject. The works of Lothar Meyer and Ostwald, published in the late 'seventies of the last century, did much to direct attention to the importance of physical chemistry. The first professor of physical chemistry was appointed only twenty-five years ago, and even now this branch of the subject is still allotted to a lecturer at some of the universities in this country.

It is now recognised that inorganic and organic chemistry will become a mere record of facts, the interpretation of which, without the aid of physical chemistry, will remain undisclosed. It is therefore a matter of congratulation to the publishers that they should have been able to arrange for the publication of a book on inorganic chemistry by a physical chemist. The author is also to be congratulated on the way in which he has fulfilled his task. Perhaps the severest test of such a book is to refer to all the parts of the work which one knows are stumbling-blocks to the ordinary intelligent student. Prof. Lowry's book stands this test remarkably well; in one case alone, the liquefaction of gases, will the information need to be supplemented by the teacher. If it had been possible to give the references to original papers the book would have sufficed for any chemist who was not intending to devote himself to inorganic chemistry as his main subject, although the author in his preface seems to disclaim the use of his book as a book of reference.

The book is admirably produced, and the illustrations are remarkable, no less for their number than for their clearness. The book may be heartily recommended.

H. B. BAKER.

Our Bookshelf.

Drahtloser Übersee-Verkehr. Von Dr. Gustav Eichhorn. Pp. 69 + xx. (Zürich: Beer et Cie, 1921.) 7 francs.

IN the first two chapters of the publication under notice, an excellent description is given of the great German radio-station at Nauen and of the receiving station at Geltow, twenty miles south of it. The third chapter discusses the theory of thermionic tubes, and the method of indicating the paths of the various currents by marking them in different colours is to be commended. The last chapter on radio-telephony is concerned mainly with modern German practice. In the Appendix a few well-known papers by Howe, Vallauri, etc., are published. The book is clearly printed, and the photographs of the Nauen station and the great lattice towers with their networks of wires show on what a huge scale it is designed.

During the last few years the station has been practically redesigned. The standard system of transmission does not yet seem to have developed. For example, they are at present constructing seven new towers, each 210 metres high, to enable them to communicate with Argentina. Under favourable atmospheric conditions the Telefunken Co., who own the station, have maintained communication with Japan for several years, although the messages have to go overland across Europe and Asia. The antennæ can be separated into four separate sections, each of which can be attached to a separate transmitter. When weather conditions are adverse all the antennæ can be connected in parallel. They then have a joint capacity of 0·01 microfarad. The two largest sections are each

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connected with 400 kw. high-frequency alternators through two or three frequency doublers connected in cascade. The smaller sections are connected to smaller machines. Although the antennæ are close they can be operated quite independently of one another.

Dr. Meissner, the engineer-in-chief, hopes to reduce the earth-resistance of the antennæ to a fraction of its present value. How much this resistance lowers the efficiency can readily be seen by the figures given in this book. For example, in one case the effective current in the antennæ is given as 360 amperes and its resistance is 2·7 ohms. We learn that radio-telephonic systems are now established between Munich and Frankfort and between Berlin and Hamburg.

Phytopaläontologie und Geologie. Von Prof. Dr. W. Deecke. Pp. iii + 97. (Berlin: Gebrüder Borntraeger, 1922). 6*s.* 3*d.*

PROF. DEECKE's essays on broad questions of geology always provide interesting reading. The present work is perhaps unduly sceptical; but its stimulus to further comparison and correlation is based on careful reasoning. While mention is made of the importance of plants as rock-formers, the main thesis is their value for geologists as indicating topographic and climatic conditions in the past. The author shows how vegetation growing on cold uplands may become entombed in the downwash from mountain-sides, and he strongly opposes the notion that the flora of a sheltered Miocene marsh at Œningen may be used as an illustration of the contemporaneous flora on the Swabian Alb. Even the beautiful theory that the occurrence of rings of growth in fossil trees indicates an orderly recurrence of seasons, while their absence indicates a uniform climate, comes in for useful criticism. Though the author states the importance of calcareous algæ in forming Carboniferous limestones and, aided by their magnesium, Triassic dolomites, we miss a reference to the Cryptozoon question. This is a mere petrographic detail in the general discussion, which leaves us with the impression that geology, including the determination of local conditions of plant-growth, may be of more service to palæophylology than phytopalæontology can be to geology. G. A. J. C.

Practical Mathematics. By A. Dakin. Part 1. (Mathematical Series for Schools and Colleges.) Pp. viii + 362 + 12 + xxiv. (London: G. Bell and Sons, Ltd., 1921.) 5*s.*

THERE should be a considerable demand for Mr. Dakin's book, as it contains just the sort of mathematics that is required by those who have to learn some elementary mathematical processes for practical use: decimals, mensuration and a few other topics in arithmetic, algebraic formulæ and equations, graphical methods, the geometry of rectilinear figures, similar figures, the circle and the sphere, with some numerical trigonometry. The treatment is very pleasant, and the student who uses the book will certainly fail to experience the aridity that the popular mind associates with mathematics. Mr. Dakin's account of graphs is particularly good; the introductory portion with the comparison and correlation graphs cannot but grip the student's interest, and make him feel that the method of graphs is worth acquiring. Historical notes are incorporated in the main text, and occasionally they are worked in very skilfully. Presumably the tables are given the title "logarithmic tables" from force of habit: they contain only natural trigonometrical ratios.

If the second part maintains the high standard of the present volume, the author will have added a valuable treatise to available books on the subject. It is to be hoped it will not suffer the fate of so many sequels. S. B.

Cours complet de mathématiques spéciales. Par Prof. J. Haag. Tome 2, Géométrie. Pp. viii + 661. (Paris: Gauthier-Villars et Cie, 1921.) 65 francs.

THIS is the second part of Prof. Haag's complete treatise on pure mathematics as required by the ordinary student specialising in mathematics. The first part dealt with algebra and analysis: the present volume is geometrical in the widest sense. We thus have analytical and synthetic geometry in two and in three dimensions, all treated simultaneously. A correct description of the book is therefore to call it a compendium of modern methods in geometry; it contains a vast amount of information of a fundamental character, and makes excellent reading.

Contrary to usual practice, especially in this country, the author does not devote very much space to conics as such. Perhaps he is right in thinking that the general practice of making a long and detailed study of the curves of the second degree tends to endow them with an importance that their practical usefulness does not justify. On the other hand the methods of the calculus are used freely.

Exercises in illustration of the principles and methods are conspicuously scarce, and no examples are given for the student to work. One is led to wonder whether a student can derive any considerable benefit from reading mathematics like a novel.

The Foundations of Æsthetics. By C. K. Ogden, I. A. Richards, and James Wood. Pp. 95 + pl. I-XV. (London: G. Allen and Unwin, Ltd., 1922.) 7*s.* 6*d.* net.

THE aim of the authors of this short treatise on æsthetics, as stated by themselves, is to present in a condensed form the greater part of accredited opinion on the subject while relating it to the main positions of the theory of art criticism. The various theories are not brought into opposition, but are distinguished to allow to each its separate sphere of validity. Beauty is thus discussed as intrinsic, in relation to the medium, to mysticism, and to its social effects and the like. They themselves find the solution of the problem in synæsthesis, a term covering a state of equilibrium and harmony in which the percipient becomes more fully himself and at the same time is in sympathetic understanding with other personalities. Hence arises the educative value of art. This theory is acceptable so far as it goes, but, like much of the current theory of æsthetics, in describing the "how" it fails to answer the question "why," a matter in which the anthropologist, censured by the authors, may be able to assist, in view of the current vogue of non-European art.

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